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EXAMINER	
RUGGLES, JOHN S	

ART UNIT	PAPER NUMBER
1756	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/609,097	STANTON ET AL.	
	Examiner	Art Unit	
	John Ruggles	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) *23-26* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☒ Claim(s) *1-22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *8/4/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicants' election **without** traverse of Group I claims 1-22 in the reply filed on 1/17/06 is acknowledged. Claims 23-26 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention. Therefore, only elected claims 1-22 remain under consideration.

Oath/Declaration

The previous objection to the oath or declaration has been overcome by the supplemental declaration filed on 1/17/06.

Specification

The abstract of the disclosure is objected to because: (1) it does not accurately reflect the invention to which the claims are directed, so line 1 should be amended as --Design [[M]]methods and ~~apparatus~~ a computer-readable medium having computer-executable instructions thereon for sidelobe suppression in a radiation-patterning tool or mask.--; (2) in line 3, "about" should be changed to --[[about]] around--; (3) in line 5, "the identified locations" should be changed to --the ~~identified locations~~ intersections of diffraction rings--; and (4) in line 6, "method for determining the location" should be changed to --a method for determining the location--. Correction is required. See MPEP § 608.01(b).

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms, which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification

are: (1) in paragraph [0006] line 6, "resultant pattern photoresist" should be corrected to --resultant patterned photoresist--; (2) in [0015] line 4, "a design feature 56 corresponding to elements 36" (singular design feature 56) should be changed to --[[a]] design features 56 corresponding to elements 36-- (plural design features 56), in order to better match the plural design features 56 shown in Figure 8; (3) in [0024-0030], each of the brief descriptions of Figures 1-7 should be changed to incorporate the phrase --prior art--, in order to correspond with the corresponding "prior art" labels in each of these figures; and (4) in [0035.1], "FIG. 12 is an enlarged view" should be corrected to --FIG. 12A is an enlarged view--, in order to correspond with Figure 12A for the enlarged view of a convergence location (from the top view of a mathematical construct shown by Figure 12). Note that due to the number of errors, those listed here are merely *examples* of the corrections needed and do *not* represent an exhaustive list thereof.

Appropriate correction is required. An amendment filed making all appropriate corrections must be accompanied by a statement that the amendment contains no new matter and also by a brief description specifically pointing out which portion of the original specification provides support for each of these corrections.

Claim Objections

Claims 1-22 are objected to because of the following informalities: (i) in claim 1 line 5, claim 7 line 8, and claim 15 line 4, "about" should be changed to --[[about]] around--, at each occurrence in order to better describe the location of a diffraction ring 70 in relation to the corresponding element 66 (as shown in Figure 10); (ii) in claim 7 line 13, it is suggested that "across" be changed to --~~across~~ on--; (iii) in claim 8 line 2, "around" should be changed (to e.g.,

--~~around~~ at--, etc.); (iv) in claim 19 line 1, "A computer-readable media" (plural) should be corrected to --A computer-readable [[media]] medium-- (singular); and (v) in claim 19 lines 5-7, "wavelength of radiation of the radiation-patterning tool; calculating an intersect of a first diffraction ring with others" should be changed to --wavelength of radiation [[of]] for the radiation-patterning tool; calculating an intersect of a first diffraction ring with ~~others~~ another--. Claims 2-6 depend on claim 1, claims 8-14 depend on claim 7, claims 16-18 depend on claim 15, and claims 20-22 depend on claim 19. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 2, 8-9, 11-12, 17, and 21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contain subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In regard to claims 2, 9, 17, and 21, the specification at [0038] lines 9-10 describe a threshold spatial distance utilized in identifying design features for a radiation-patterning tool or mask to be about eight-tenths of the wavelength divided by the numerical aperture (**~0.8λ/NA**) in connection with the mathematical construct or model (for designing the mask) in Figure 10 showing the diffraction rings 70, each having a radius 68. This clearly does not enable a diffraction ring radius (68) of about eight-tenths of the wavelength of radiation (***~0.8λ***), as recited in claims 2, 9, 17, and 21. However, for the purpose of this Office action and in order to

advance the prosecution of this application, claims 2, 9, 17, and 21 have each been interpreted to mean that the diffraction ring radius (68) is about eight-tenths of the wavelength divided by the numerical aperture (**~0.8λ/NA**), in accordance with the specification at [0038].

Also, the claim 8 recitation for each of the mathematical descriptions of diffraction rings (70 in Figure 10) to be defined from a "centroid" of the mathematical description of one of the elements (66 in Figure 10) is not found to be adequately supported in the specification. However, for the purpose of this Office action, "centroid" in claim 8 has been interpreted to mean --~~centroid~~ center--. Claim 9 depends on claim 8.

Furthermore, in claim 11 lines 4-5, the phrase "more proximate than a predefined threshold" with regard to the proximity of two or more sidelobe inhibitors (77 in Figure 10) is also not sufficiently enabled by the specification. Claim 12 depends on claim 11.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-14, 16, 18, and 20-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, the phrase "method for mitigating sidelobe artifacts in a radiation-patterning **process**" (emphasis added) in the preamble (lines 1-2) does not correspond with the body of this claim, which recites "defining elements to be formed in a radiation-patterning tool..." (lines 3-4), "calculating a diffraction ring about each of the elements" (line 5), "identifying at least one location..." (lines 6-7), and "forming at least one sidelobe inhibitor..." (line 8). For the purpose

of this Office action, the above phrase in lines 1-2 has been interpreted to mean --method for mitigating sidelobe artifacts in a radiation-patterning ***tool design process***-- (emphasis added).

In claim 1 line 4 and in claim 7 lines 4-5, the phrase "to create desired patterns **and** resultant sidelobes" (emphasis added) seems to suggest creating desired sidelobes that does not correspond with either (A) the earlier stated intention for mitigating sidelobe artifacts (in claim 1 line 1) by forming at least one sidelobe inhibitor (in claim 1 line 8) nor (B) the recited generating or forming of sidelobe inhibitors (in claim 7 lines 1 and 13). For the purpose of this Office action, the above phrase in claim 1 line 4 and claim 7 lines 4-5 has been interpreted to mean --to create desired patterns ***[[and]]*** ***without*** resultant sidelobes--, at both occurrences. Claims 2-6 depend on claim 1 and claims 8-14 depend on claim 7.

In claims 3, 10, 18, and 22, it is unclear whether the "dimensions" of the sidelobe inhibitor(s) are meant to refer to (1) the length for the sides of each sidelobe inhibitor 77 (indicating that each sidelobe inhibitor 77 is square in shape as shown in Figure 10) or (2) some other measurement of each sidelobe inhibitor 77 (such as the diagonal of each square sidelobe inhibitor 77 shown in Figure 10). For the purpose of this Office action, the "dimensions" of the sidelobe inhibitor(s) in claims 3, 10, 18, and 22 have been interpreted in accordance with (1) above, to mean --side dimensions--.

In claim 4 line 4-6, it is unclear whether "overlap range" was intended to be (3) an overlap range of adjacent diffraction rings 70 shown in Figure 10 as described in [0039] lines 5-8 or (4) a guard ring (102 or 104) extending around each of the plurality of locations (92 and 94) shown in Figure 12A as described in [0042]. For the purpose of this Office action, "overlap range" in lines 4-6 of claim 4 has been interpreted to mean --~~overlap range~~ guard ring--, in

accordance with (4) above. Also for the purpose of this Office action, the phrase "the locations" in claim 4 lines 4-7 have been interpreted (at all four occurrences) as being corrected to --the plurality of locations--, in order to better correspond with the antecedent basis for this phrase "plurality of locations" found in claim 4 line 2. Similar problems were also found in claim 16, so for the purpose of this Office action corresponding changes have been interpreted as being made in claim 16, as well.

Also in claim 4 at lines 8-9, the phrase "forming sidelobe inhibitors across at least a portion of the locations and the common locations" is not fully consistent with the previous recitations of claim 4 (shown by Figure 12A as interpreted above). For the purpose of this Office action, the above phrase in lines 8-9 of claim 4 has been interpreted to mean --forming the at least one sidelobe inhibitor[[s]] across at least a portion of the plurality of locations [[and]] or the common location[[s]]--. Again, similar problems were also found in claim 16, so for the purpose of this Office action corresponding changes have been interpreted as being made in claim 16, as well.

In order to address the similar problems found in claim 16 in relation to those in claim 4 as mentioned above, claim 16 lines 3-7 have been interpreted as follows: --defining ~~an overlap range~~ a guard ring extending around each of the plurality of intersections; defining a common intersection in lieu of each of the plurality of intersections when a portion of ~~an overlap range~~ the guard ring extending from one of the plurality of intersections is common with a portion of ~~an overlap range~~ the guard ring extending from another one of the plurality of intersections; and forming a sidelobe inhibitor[[s]] across at least a portion of each of the plurality of intersections [[and]] or across--.

In claim 7 lines 13-14, it is unclear how plural sidelobe inhibitors would be formed on "the radiation-patterning tool corresponding to at least **one** of the mathematical descriptions of locations" (emphasis added). For the purpose of this Office action and to better correspond with Figure 10 as described in [0039], this recitation in claim 7 lines 13-14 has been interpreted to mean that plural sidelobe inhibitors would be formed on --the radiation-patterning tool ~~corresponding to~~ with one of the plural sidelobe inhibitors at ~~least one~~ each of ***two*** or more of the mathematical descriptions of locations-- (emphasis added). Claims 8-14 depend on claim 7.

In claim 9, it is unclear whether or not "**a** radius" (emphasis added) in line 1 is the same as that recited in claim 8 (on which claim 9 depends) and the phrase "the mathematical description of diffraction ring" in lines 1-2 does not correspond with the immediately preceding antecedent basis for this phrase found in claim 8. However, for the purpose of this Office action and in order to advance the prosecution of this application, these portions of claim 9 in lines 1-2 have been interpreted to mean --[[**a**]] ***the*** radius of each of the mathematical descriptions of diffraction rings-- (emphasis added).

In claims 11-12, it is uncertain whether the "predefined threshold" (found in claim 11 lines 4-5 and claim 12 lines 1-2) with regard to the proximity of two or more sidelobe inhibitors (77 in Figure 10) is meant to be measured between (5) the closest outer edges or (6) the centers of the "more proximate" sidelobe inhibitors, so that the "predefined threshold" for the proximity is about half to about one of the defined wavelength of radiation (claim 12, $\sim\lambda/2$ to $\sim\lambda$). For the purpose of this Office action and in order to afford the broadest reasonable interpretation to claims 11-12, the "predefined threshold" has been interpreted to mean either (5) or (6) as set forth above.

In claim 20, the recitation of three separate "identifying" steps (in lines 2, 3, and 5) is confusing and unclear about which of these steps refers back to the "identifying the intersect" in claim 19 line 8 (on which claim 20 depends). For the purpose of this Office action, these claim 20 three "identifying" steps have been further interpreted to be clarified as follows: (a) in line 2, "identifying" has been interpreted to mean --the identifying-- (in direct reference to the "identifying the intersect" in claim 19 line 8); (b) in line 3, "identifying ones of intersects" has been interpreted to mean --first ~~identifying~~ identification of one[[s of]] intersect[[s]]--; and (c) in line 5, "identifying a common intersect in lieu of intersects resulting in overlap" has been interpreted to mean --second ~~identifying~~ identification of a common ~~intersect~~ intersect, in lieu of intersects resulting in ~~overlap~~ overlap,--.

In claim 21, it is unclear whether or not the phrase "calculating a diffraction ring includes calculating a diffraction ring having a radius" in line 2 was meant to refer back to the same step of calculating a diffraction ring in claim 19 line 4 (on which claim 21 depends). However, for the purpose of this Office action, this phrase in line 2 of claim 21 has been interpreted to mean --the calculating a diffraction ring includes ~~calculating~~ that for a diffraction ring having a radius--.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5-10, 13-15, 17-19, and 21-22 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hasegawa et al. (US Patent 5,700,601).

Hasegawa et al. teach a phase shifting photomask (instant claims 6 and 14), mask (PSM), reticle (instant claims 5 and 13), or radiation-patterning tool that has a transparent main pattern area in a semi-transparent film and a transparent auxiliary pattern of sidelobe inhibitor(s) placed around or near the main pattern area to prevent generation of an unnecessary projected image (for mitigating, suppressing, or inhibiting sidelobes), a system for designing the mask, and a method for manufacturing the mask (title, abstract). Figures 3 and 9-10 (embodiments 2 and 4, respectively) show a radius (D, D') from the center or centroid of a main circular or square feature or opening (4, 8) to an undesirable diffraction ring, where one or more sub-resolution dimension transparent auxiliary patterns or sidelobe inhibitors (5, 9) having the same phase as the main pattern and placed at optimum positions with respect to the main pattern would be expected to suppress sidelobe printing (col. 20 line 41 to col. 21 line 56, col. 22 line 40 to col. 23 line 19, col. 27 lines 46-55, and col. 29 line 66 to col. 30 line 8). The diffraction ring radius (D, D') = $b\lambda/NAm$, where $1.35 < b \leq 1.9$, λ is the wavelength of exposure light, and NAm is the mask-side numerical aperture of the projection lens (abstract). The auxiliary patterns or sidelobe inhibitors are either continuous (5 as shown in Figure 3) or separated into plural elements (9 as shown in Figures 9-10). Figures 16(b) and 17 in embodiment 8 show the effect of auxiliary

sidelobe inhibitor square patterns with two closely spaced square main patterns (the radius of the corresponding diffraction ring (S) = sλ/NA, where S = 650nm, λ = 365nm, NA = 0.52, and s = 0.926, which means that the radius S = 0.926 λ/0.52 ~ 0.9λ/NA or the radius (S) is about 0.8λ/NA to reduce the undesirable sidelobe intensity peaks at P2 and P3 as shown in curve "d" of Figure 17, while the width of the auxiliary sidelobe inhibitor square patterns I = 200nm = iλ/NA, leading to i = 0.285 so that the width I = 0.285λ/0.52 = 0.548λ ~ 0.5λ (col. 26 line 56 to col. 27 line 55, reading on the instant claims 2, 9, 17, and 21 for a diffraction ring radius interpreted in view of instant paragraph [0038] to mean about 0.8λ/NA and also reading on instant claims 3, 10, 18, and 22 for a sidelobe inhibitor side dimension or width of about λ/2). Embodiment 5 describes the use of a computer system and associated data file unit (understood to necessarily include a computer-readable medium having computer-executable instructions) to design the layout of the size(s) and desired position(s) for the auxiliary sidelobe inhibitor patterns with respect to the main patterns on the mask (col. 23 line 20 to col. 24 line 67), which is believed to be inherently or obviously capable of performing the necessary calculations for defining main pattern elements and mathematical descriptions of associated diffraction rings or even guard rings, each having a predetermined radius (S = about 0.8λ/NA, as discussed above), and the intersections thereof for determining the placement locations of plural auxiliary sidelobe inhibitor patterns (each having a width or side dimension of about λ/2, as discussed above) with respect to the main pattern elements on the mask (reading on instant claims 1, 7-8, 15, and 19).

Claims 4, 11-12, 16, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (US Patent 5,700,601) in view of Kobayashi et al. (US Patent 5,700,606).

Hasegawa et al. do not specifically teach designing a mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations and a computer-readable medium having computer-executable instructions thereon for designing this mask pattern (as required by instant claims 4, 11-12, 16, and 20).

Kobayashi et al. teach a photomask, mask, reticle, or radiation-patterning tool having a patterned halftone film with an overlying light-shielding pattern at a position from which a sidelobe would be formed (the light-shielding pattern functions to inhibit, suppress, or mitigate a sidelobe) and a method of manufacturing it (title, abstract). Figures 7(a-c) and 8(a-c) show examples of overlapping/intersecting diffraction rings 12 (each around a main contact opening 11 that is adjacent to another main contact opening 11) for determining the placement of a sidelobe inhibitor on the mask at intersection 14 of adjacent diffraction rings to make circular images for contact holes without undesirable sidelobes 16 as shown in Figs 7(c) and 8(c) (col. 2 lines 48-59). The intensity of unwanted sidelobes becomes greater at closer pitches for main contact openings on the mask having a greater number of diffraction ring overlaps. The position of sidelobe generation from identified diffraction rings, each around a main contact opening in the mask pattern, can be calculated from the pattern size, pitch, and exposure conditions (col. 5 line 48 to col. 6 line 23, which encompasses the use of a guard ring extension or another similar mathematical construct around each intersection location between adjacent diffraction rings). A first mask having plural sidelobe inhibitors 3 is shown by Figures 2(a-b), in which the sidelobe inhibitors 3 have a width W1 for a first spacing between adjacent main contact openings on the mask, such that only two corresponding adjacent diffraction rings form intersections therebetween, as shown by position "II" in Fig 8(a). Figures 3(a-b) show an alternative second

mask having a single common sidelobe inhibitor 3 with a width W2 that is centrally located between 4 main contact openings positioned at a second closer spacing than those on the first mask such that more than two corresponding adjacent diffraction rings form plural intersections therebetween, instead of or in lieu of placing overlapping sidelobe inhibitor(s) at each of plural diffraction ring intersections at or near a common location, as shown by position "I" in Fig 8(a) (col. 6 line 46 to col. 7 line 24). The method of manufacturing such masks is described at col. 7 line 25 to col. 9 line 24) in reference to Figures 1(a-g). With this method, it is easy to place the sidelobe inhibitor pattern at predetermined position(s) on the mask with high accuracy to prevent sidelobe printing from the mask (col. 4 lines 1-4).

It would have been obvious to one of ordinary skill in the art at the time of the invention in the photomask, mask, reticle, or radiation-patterning tool that has a transparent main pattern area in a semi-transparent film and a transparent auxiliary pattern of sidelobe inhibitor(s) placed around or near the main pattern area to prevent generation of an unnecessary projected image (for mitigating, suppressing, or inhibiting sidelobes), a system for designing the mask, and a method for manufacturing the mask (taught by Hasegawa et al. and discussed above) to design the mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations, when needed to accommodate the greater intensity of unwanted sidelobes at closer pitches for main contact openings on the mask having a greater number of calculated and identified diffraction ring overlap intersections at or near a common location (taught by Kobayashi et al. as illustrated in Fig 8(a) for the position "I" mask patterns at a closer pitch having a greater number of diffraction ring overlaps in comparison to the position "II" mask patterns at a more distant pitch having a lesser number of diffraction ring

overlaps). With this combined method of designing the mask and a computer-readable medium having computer-executable instructions thereon for designing this mask pattern, it is easy to calculate diffraction rings corresponding to the position and size of plural main contact openings on the mask, identify intersection location(s) for adjacent diffraction rings (e.g., with a guard ring extension or another similar mathematical construct around each intersection location for defining a common location in lieu of plural locations when such plural locations are closer or more proximate than a predetermined threshold (instant claim 11) to avoid overlap of plural sidelobe inhibitors each having a width or side dimension of about $\lambda/2$ (as discussed above, instant claim 12) or when plural guard ring extensions overlap (instant claims 16 and 20), etc.), and place one or more sidelobe inhibitor pattern(s) at predetermined position(s) on the mask with high accuracy to prevent sidelobe printing from the mask, as taught by Hasegawa et al. and Kobayashi et al. (reading on instant claim 4).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-3, 5-10, 13-15, 17-19, and 21-22 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-12, 14-18, 20, 22, 24-25, 35-38, and 43-46 of US Patent 6,807,519 (Stanton '519) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above). The conflicting claims of Stanton '519 are not identical to the instant claims, at least because the Stanton '519 patent claims recite relative spatial orientations of mask elements and vectors spanning between edges of design features within a threshold spatial distance to define placement of sidelobe inhibitors for laying out a mask pattern by a first computer design, whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '519 patent claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al., as discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the photomask, mask, reticle, or radiation-patterning tool design and computer readable media embodying computer readable code for determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer design (as recited by the patent claims of Stanton '519) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask.

Claims 4, 11-12, 16, and 20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6-12, 14-18, 20, 22, 24-25, 35-38, and 43-46 of US Patent 6,807,519 (Stanton '519) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above), and further in view of Kobayashi et al. (US Patent 5,700,606, as discussed above). The conflicting claims of Stanton '519 are not identical to the instant claims, at least because the Stanton '519 patent claims recite relative spatial orientations of mask elements and vectors spanning between edges of design features within a threshold spatial distance to define placement of sidelobe inhibitors for laying out a mask pattern by a first computer design, whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '519 patent claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al. and Kobayashi et al., both of which are discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the photomask, mask, reticle, or radiation-patterning tool design and computer readable media embodying computer readable code for determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer design (as recited by the patent claims of Stanton '519) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask. It would also have been obvious in the combined

second computer design of sidelobe inhibitors for laying out a mask pattern (as recited by the patent claims of Stanton '519 and taught by Hasegawa et al., previously set forth above) to design the mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations, when needed to accommodate the greater intensity of unwanted sidelobes at closer pitches for main contact openings on the mask having a greater number of calculated and identified diffraction ring overlap intersections at or near a common location (as taught by Kobayashi et al. and discussed above). With this combined method of designing the mask and a computer-readable medium having computer-executable instructions thereon for designing this mask pattern, it is easy to calculate diffraction rings corresponding to the position and size of plural main contact openings on the mask, identify intersection location(s) for adjacent diffraction rings (e.g., with a guard ring extension or another similar mathematical construct around each intersection location for defining a common location in lieu of plural locations when such plural locations are closer or more proximate than a predetermined threshold (instant claim 11) to avoid overlap of plural sidelobe inhibitors each having a width or side dimension of about $\lambda/2$ (as discussed above, instant claim 12) or when plural guard ring extensions overlap (instant claims 16 and 20), etc.), and place one or more sidelobe inhibitor pattern(s) at predetermined position(s) on the mask with high accuracy to prevent sidelobe printing from the mask, as recited by the patent claims of Stanton '519 in combination with the teachings of Hasegawa et al. and Kobayashi et al. (reading on instant claim 4).

Claims 1-3, 5-10, 13-15, 17-19, and 21-22 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 51-61 of

copending Application No. 10/953,982 (corresponding to US Publication 2005/0049839, Stanton '982) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above). The conflicting claims of Stanton '982 are not identical to the instant claims, at least because the Stanton '982 application claims recite a method of forming a reticle, photopatterning tool, or mask that includes defining pattern features on the mask and determining which pattern features are within a threshold distance between these pattern features that can lead to sidelobe overlap, calculating vectors describing the distance and direction between edges of the pattern features that are within the threshold spatial distance, utilizing the vectors to identify regions of the mask where sidelobe overlap can occur (for laying out a mask pattern by a first computer design), and forming sidelobe inhibitors across at least some of the identified regions of the mask, whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '982 application claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al., as discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the method of forming a reticle, photopatterning tool, or mask that includes determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer design (as recited by the application claims of Stanton '982) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 4, 11-12, 16, and 20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 51-61 of copending Application No. 10/953,982 (corresponding to US Publication 2005/0049839, Stanton '982) in view of Hasegawa et al. (US Patent 5,700,601, as discussed above), and further in view of Kobayashi et al. (US Patent 5,700,606, as discussed above). The conflicting claims of Stanton '982 are not identical to the instant claims, at least because the Stanton '982 application claims recite a method of forming a reticle, photopatterning tool, or mask that includes defining pattern features on the mask and determining which pattern features are within a threshold distance between these pattern features that can lead to sidelobe overlap, calculating vectors describing the distance and direction between edges of the pattern features that are within the threshold spatial distance, utilizing the vectors to identify regions of the mask where sidelobe overlap can occur (for laying out a mask pattern by a first computer design), and forming sidelobe inhibitors across at least some of the identified regions of the mask, whereas the instant claims involve descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out a mask pattern by a second computer design. The Stanton '982 application claims also do not specifically recite other instantly claimed limitations that are taught by Hasegawa et al. and Kobayashi et al., both of which are discussed above.

However, it would still have been obvious to one of ordinary skill in the art at the time of the invention in the method of forming a reticle, photopatterning tool, or mask that includes determining placement of sidelobe inhibitors for laying out a mask pattern by a first computer

design (as recited by the application claims of Stanton '982) to utilize an alternative second computer design known for some time that involves descriptions of diffraction ring intersections to define placement locations of sidelobe inhibitors for laying out the mask pattern (as taught by Hasegawa et al. and previously set forth above), both of which are computer derived mathematical constructs for determining the placement of sidelobe inhibitors on a mask. It would also have been obvious in the combined method of designing and forming a reticle, photopatterning tool, mask, photomask, or radiation-patterning tool that includes determining placement of sidelobe inhibitors for laying out a mask pattern by a second computer design of sidelobe inhibitors for laying out a mask pattern (as recited by the application claims of Stanton '982 and taught by Hasegawa et al., previously set forth above) to design the mask pattern having a single sidelobe inhibitor at a single common location in lieu of separate sidelobe inhibitors at plural locations, when needed to accommodate the greater intensity of unwanted sidelobes at closer pitches for main contact openings on the mask having a greater number of calculated and identified diffraction ring overlap intersections at or near a common location (as taught by Kobayashi et al. and discussed above). With this combined method of designing and forming the mask and a computer-readable medium having computer-executable instructions thereon for designing this mask pattern, it is easy to calculate diffraction rings corresponding to the position and size of plural main contact openings on the mask, identify intersection location(s) for adjacent diffraction rings (e.g., with a guard ring extension or another similar mathematical construct around each intersection location for defining a common location in lieu of plural locations when such plural locations are closer or more proximate than a predetermined threshold (instant claim 11) to avoid overlap of plural sidelobe inhibitors each having a width or

side dimension of about λ/2 (as discussed above, instant claim 12) or when plural guard ring extensions overlap (instant claims 16 and 20), etc.), and place one or more sidelobe inhibitor pattern(s) at predetermined position(s) on the mask with high accuracy to prevent sidelobe printing from the mask, as recited by the application claims of Stanton '982 in combination with the teachings of Hasegawa et al. and Kobayashi et al. (reading on instant claim 4).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Ruggles whose telephone number is 571-272-1390. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John Ruggles
Examiner
Art Unit 1756

S. ROSASCO
PRIMARY EXAMINER
GROUP 1500